

What is claimed is:

1. A gas chromatograph column, which column comprises at least two lid layers and a channel layer, wherein each of said layers comprises a compact material suitable for gas chromatograph, said channel layer comprises microfabricated channels on both sides, said 5 microfabricated channels and a side of said lid layers form at least two capillaries, said at least two capillaries are connected to each other through a hole in said channel layer to form an integrated capillary, said integrated capillary is connected to outside atmosphere on both ends via holes on two outmost lid layers to serve as an inlet and an outlet.
2. The gas chromatograph column of claim 1, which comprises more than two lid 10 layers and more than one channel layer and an integrated capillary is formed through all the lid and channel layers.
3. The gas chromatograph column of claim 1, which comprises three lid layers and two channel layers and an integrated capillary is formed through all the lid and channel layers.
4. The gas chromatograph column of claim 1, wherein the compact material is 15 selected from the group consisting of metal, polymer, ceramic, silicon, quartz, glass and a combination thereof.
5. The gas chromatograph column of claim 1, wherein the lid layers and the channel layer comprise same or different compact material(s).
6. The gas chromatograph column of claim 1, wherein the lid layers have an area 20 ranging from about 1 to about 100 cm².
7. The gas chromatograph column of claim 1, wherein the channel layer has an area ranging from about 1 to about 100 cm².
8. The gas chromatograph column of claim 1, wherein the lid layers and the channel layer have same or different area(s).
- 25 9. The gas chromatograph column of claim 1, wherein the lid layers and the channel layer have a thickness ranging from about 0.1 to about 5 mm.

10. The gas chromatograph column of claim 1, wherein the microfabricated channels have a width ranging from about 1 to about 1,000 microns.

11. The gas chromatograph column of claim 1, wherein the microfabricated channels have a depth ranging from about 3 to about 500 microns.

5 12. The gas chromatograph column of claim 1, wherein the microfabricated channels are formed by a wet etching method.

13. The gas chromatograph column of claim 1, wherein the microfabricated channels are formed by a dry etching method.

14. The gas chromatograph column of claim 1, wherein the integrated capillary has a
10 total length of at least 4 meters.

15. The gas chromatograph column of claim 1, wherein the integrated capillary has a sectional shape selected from the group consisting of a trapezia, a rectangle, a circle, a semicircle, a sector and a combination thereof.

16. The gas chromatograph column of claim 1, wherein the cross-section of the
15 integrated capillary has an area ranging from about 5 to about 250,000 square microns.

17. The gas chromatograph column of claim 1, wherein the integrated capillary has identical or different cross-section area(s) along its length.

18. The gas chromatograph column of claim 1, wherein the integrated capillary has a serpentine or spiral pattern.

20 19. The gas chromatograph column of claim 1, wherein the wall of the integrated capillary is coated with a thin film of a stationary phase.

20. The gas chromatograph column of claim 19, wherein the stationary phase is applied via a deposition method, a dynamic lining method or a static lining method.

21. The gas chromatograph column of claim 19, wherein the stationary phase is
25 applied before or after the layers are bound together.

22. The gas chromatograph column of claim 1, wherein the hole in the channel layer and the holes in the lid layers have a square or a round shape.

23. The gas chromatograph column of claim 1, wherein the hole in the channel layer and the holes in the lid layers are formed by laser ablation, micromachining or etching.

24. The gas chromatograph column of claim 1, wherein the layers are bound together by anodic bonding, ultrasonic welding, heat bonding or gluing.

5 25. The gas chromatograph column of claim 1, which further comprises a heater wire deposited on an outside surface of the integrated capillary to provide for electric heating of a stationary phase material within the integrated capillary during operation of a gas chromatograph.

10 26. A gas chromatograph column, which column comprises at least two lid layers and at least two channel layers, wherein each of said layers comprises a compact material suitable for gas chromatograph, said channel layers comprise microfabricated channels on a side, said microfabricated channels and a side of said lid or channel layers form at least two capillaries, said at least two capillaries are connected to each other through a hole in said channel and/or lid layer to form an integrated capillary, said integrated capillary is connected
15 to outside atmosphere on both ends via holes on two outmost lid layers to serve as an inlet and an outlet.

27. The gas chromatograph column of claim 26, wherein at least one of the channel layers comprises microfabricated channels on one side and the other side of the same channel layer directly faces microfabricated channels of another channel layer to form a capillary.

20 28. The gas chromatograph column of claim 26, wherein at least one of the channel layers comprises microfabricated channels on both sides and said microfabricated channels and a side of the lid layers form at least two capillaries.

29. A gas chromatograph system, which system comprises:

a) a gas injector for introducing a mobile phase including a sample gas in a carrier
25 gas;

b) a gas chromatograph column of claim 1 comprising a stationary phase suitable for gas chromatograph and mechanically connected to receive said mobile phase from said gas injector for the separation of an analyte in said sample gas; and

5 c) a detector mechanically connected to said column for the analysis of said separated analyte of said sample gas with an electronic means.

30. A gas chromatograph system, which system comprises:

a) a gas injector for introducing a mobile phase including a sample gas in a carrier gas;

10 b) a gas chromatograph column of claim 26 comprising a stationary phase suitable for gas chromatograph and mechanically connected to receive said mobile phase from said gas injector for the separation of an analyte in said sample gas; and

c) a detector mechanically connected to said column for the analysis of said separated analyte of said sample gas with an electronic means.

31. A method for analyzing an analyte in a sample, which method comprises:

15 a) providing a gas chromatograph system of claim 29;

b) vaporizing a sample to a gas phase;

c) injecting said sample gas in a carrier gas into said gas chromatograph system;

and

20 d) allowing separation and detection of an analyte in said sample in said gas chromatograph system to assess the presence, absence or amount of said analyte in said sample.

32. The method of claim 31, wherein the analyte is a molecule or an aggregate or complex thereof.

33. The method of claim 32, wherein the molecule is selected from the group consisting of an inorganic molecule, an organic molecule and a complex thereof.

25 34. The method of claim 33, wherein the organic molecule is selected from the group consisting of methane, chloroform, benzene and butyric acid.

35. The method of claim 31, wherein the analyte is selected from the group consisting of a chemical compound, a metabolite of a chemical compound and a complex thereof.

36. The method of claim 31, wherein the sample is mammalian sample.

5 37. The method of claim 36, wherein the mammal is selected from the group consisting of bovine, goat, sheep, equine, rabbit, guinea pig, murine, human, feline, monkey, dog and porcine.

38. The method of claim 31, wherein the sample is a clinical sample.

10 39. The method of claim 38, wherein the clinical sample is selected from the group consisting of serum, plasma, whole blood, sputum, cerebral spinal fluid, amniotic fluid, urine, gastrointestinal contents, hair, saliva, sweat, gum scrapings and tissue from biopsies.

40. The method of claim 38, wherein the clinical sample is a human clinical sample.

41. The method of claim 31, wherein the sample is a body fluid sample.

15 42. The method of claim 31, wherein the sample is an atmosphere, water, soil, drug or explosive sample.

43. The method of claim 31, wherein the carrier gas is an inert gas.

44. The method of claim 43, wherein the inert gas is selected from the group consisting of nitrogen, hydrogen, helium and argon.

45. The method of claim 31, wherein the sample is vaporized in a carrier gas.

20 46. The method of claim 31, wherein the sample is vaporized in the absence of a carrier gas and is then mixed before or while injected into the gas chromatograph system.

47. A method for analyzing an analyte in a sample, which method comprises:

a) providing a gas chromatograph system of claim 30;

b) vaporizing a sample to a gas phase;

25 c) injecting said sample gas in a carrier gas into said gas chromatograph system;

and

d) allowing separation and detection of an analyte in said sample in said gas chromatograph system to assess the presence, absence or amount of said analyte in said sample.